

*INL's Fuel Conditioning Facility supports work to demonstrate the technical feasibility of a nuclear recycling technique called pyroprocessing.*



## Fuel Conditioning Facility

**T**he Fuel Conditioning Facility (FCF) at Idaho National Laboratory's Materials and Fuels Complex supports nuclear energy research and development for the U.S. Department of Energy and other customers. Its unique capabilities make FCF an ideal facility for its primary mission to support treatment of DOE-owned sodium-bonded metal fuel.

In a secondary role, FCF also supports work to demonstrate the technical feasibility of pyroprocessing technology for treating used nuclear fuel for DOE's Fuel Cycle Research and Development Program. Pyroprocessing is a technology that uses electricity to separate waste products from useful materials in used nuclear fuel, including

electrorefining and cathode processing.

### Key Capabilities

- Engineering-scale equipment for treatment of sodium-bonded metallic fuel to deactivate the reactive

sodium metal, recover fissionable uranium, and separate fission and activation products for incorporation into solid waste forms suitable for geologic disposal.

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*Heavily shielded hot cells equipped with remotely operated manipulators enable researchers to safely handle irradiated fuels and materials.*

*The Energy of Innovation*

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- Heavily shielded hot cells, one with a dry argon gas atmosphere, equipped with remotely operated manipulators to safely handle irradiated fuels and materials.
- Systems to support handling of heavily shielded shipping casks for fuel receipt and waste disposal.
- Hot repair area equipped with remotely operated decontamination equipment, a specialized manipulator repair facility, and other maintenance and waste-handling equipment.
- Pneumatic “rabbit” system for transfer of material samples to and from MFC’s Analytical Laboratory (AL) or its Hot Fuels Examination Facility (HFEF).
- Mock-up area to allow thorough testing of new remotely operated systems prior to their installation into FCF, HFEF or AL hot cells.

#### **History**

- Originally called the Fuel Cycle Facility, the Fuel Conditioning Facility was first activated in 1963 by Argonne National

Laboratory-West (ANL-W, now known as MFC), with a mission to demonstrate the feasibility of on-site reprocessing and fabrication of fuel for the adjacent Experimental Breeder Reactor II (EBR-II), which was a prototype for the Integral Fast Reactor concept — a sodium-cooled, metallic fuel, fast breeder reactor with inherent, passive safety features.

- The original FCF demonstration was successfully carried out from 1964 to 1968. Later, its primary role changed to repackaging of spent EBR-II fuel for shipment to the Idaho Nuclear Technology and Engineering Center (INTEC).
- Refurbishment of the FCF hot cells, including the remotely operated overhead handling equipment, was conducted in the late 1970s and early 1980s after the HFEF became operational. Major modifications to FCF were made in the late 1980s and early 1990s to support the Integral Fast Reactor Program and the historic tests of its passive safety features in EBR-II.

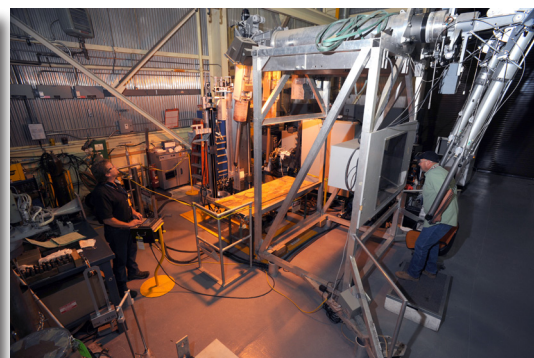
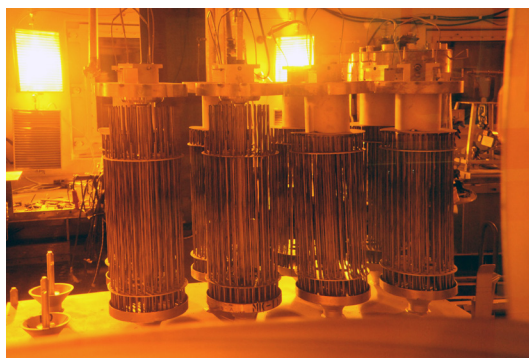
Remotely operated electrometallurgical process equipment was installed in the hot cells to recover uranium and transuranic actinides from used IFR fuel and refabricate it into new fuel for the reactor.

- Major features of the hot cell facility are: an air atmosphere cell where fuel assemblies are disassembled into individual fuel elements, an argon atmosphere cell where the spent fuel elements are prepared and treated, and a hot repair area located in the basement where contaminated equipment can be washed and repaired.
- Upon shutdown of the IFR program in 1995, the facility name was changed to its current name, the Fuel Conditioning Facility. The process equipment was repurposed to treat legacy DOE sodium-bonded metallic fuel to make it suitable for disposal. The process was modified by eliminating the recovery of transuranic actinides, which are now left with the fission products to be incorporated into a durable waste form and disposed of as high-level waste.

#### **For more information**

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**FCF includes this hot cell holding EBR-II fuel awaiting treatment, left, and a mock-up shop where technicians can build and test new hot cell equipment, right.**